

CLAIMS

What is claimed is:

1. A foam product produced by a process comprising the steps of:
providing a pre-foam stream at a first pressure;
intermittently injecting at least one additive into the pre-foam stream ^{in the mixing head} at a pressure ^{under mixing conditions sufficient to provide for} higher than the first pressure, ~~providing~~ a laminar flow pre-foam stream with alternating segments;
pouring said laminar flow pre-foam stream onto a surface; and
curing said pre-foam stream into a foam product having discrete alternating stripes with different properties.
2. A foam product of claim 1, wherein the at least one injector injects the additive into a laminar region of the pre-foam stream while substantially maintaining the laminar flow in the laminar region.
3. The foam product of claim 1, wherein the additive is a coloring agent, and the alternating stripes vary in color.
4. A foam product of claim 1, wherein the alternating stripes vary in at least one of width, density, hardness, air permeability, tensile strength and load bearing capacity properties of said foam.
5. The foam product of claim 1, wherein the foam product is a foam bun.

6. A foam product comprising an alternatingly, discretely striped foam sheet peeled from the foam bun of claim 5.

7. The product of claim 1, having two or more alternating stripes, having different properties.

8. An article comprising the foam product of claim 3, wherein the article is a clothing article or a blanket or an insulator.

9. A method comprising the steps of:
providing a pre-foam stream at a first pressure;
intermittently injecting at least one additive into the pre-foam stream at a pressure higher than the first pressure, providing a laminar flow pre-foam stream with alternating segments; and
pouring said laminar flow pre-foam stream onto a surface, to provide a discretely striped foam.

10. The method of claim 9, wherein the stripes of the foam vary in chemical composition.

11. The method of claim 9, further comprising the step of conveying the poured pre-foam stream in a direction generally perpendicular to the direction of pouring of the

pre-foam stream to produce a discretely striped foam bun with alternating stripes of varying properties.

12. The method of claim 9, wherein the poured pre-foam stream is poured at an angle to minimize the intermixing of the pre-foam stream.

13. The method of claim 11, wherein the segments of the alternately segmented pre-foam stream are generally perpendicular to the flow of the pre-foam stream.

14. The method of claim 9, wherein at least one additive is a colorant.

15. The method of claim 9, wherein the segmented pre-foam stream is poured to produce an alternately striped foam bun rotatable about an axis of rotation.

16. The method of claim 15, further comprising the step of peeling a striped, layer of foam from the foam bun.

17. The method of claim 16, wherein the peeling step includes peeling around the circumference of the foam bun to provide stripes generally at an angle to the axis of the cylindrical bun.

18. The method of claim 16, further comprising the step of cutting a striped sheet from the peeled layer of foam.

19. The method of claim 15, further comprising the step of cutting a discretely striped foam shape from said alternately striped, foam bun.

20. The method of claim 19, wherein the step of cutting the striped, foam shape comprises cutting a rectangular striped, foam shape.

21. The method of claim 9, wherein the pre-foam stream is provided by mixing a non-reactant stream with an isocyanate to produce a pre-foam stream.

22. The method of claim 9, wherein the step of intermittently injecting includes injecting the at least one additive into a laminar flow region of the pre-foam stream, providing a laminar flow segmented pre-foam stream.

23. The method of claim 9, wherein the step of intermittently injecting further comprises simultaneously injecting at least one additive from at least two points of injection.

24. The method of claim 9, wherein the step of intermittently injecting further comprises, at different times, injecting at least one additive from at least two points of injection.

25. The method of claim 9, comprising varying the time interval between intermittently injecting the at least one additive from at least one point of injection.

26. The method of claim 9, wherein the step of injecting comprises pulsing an injector orifice open and shut.

27. The method of claim 9, wherein the step of pouring said pre-foam stream onto a surface includes pouring said pre-foam stream into a trough.

28. The method of claim 9, wherein the step of pouring comprises pouring said pre-foam stream into a form carried on a conveyor.

29. The method of claim 28, wherein the form is a generally cylindrical form.

30. The method of claim 28, wherein the form is a rectangular form.

31. The method of claim 9, wherein the additive is a unique marker compound or combination of compounds that can be associated with the foam product as a unique identifier.

32. The method of claim 9, wherein said additive varies at least one of density, hardness, thickness, air permeability, tensile strength and load bearing capacity properties of said foam.

33. The method of claim 9, wherein the pre-foam stream at a first pressure comprises a polyol, an isocyanate, and water at given ratios, which are varied by the at least one additive.

34. The method of claim 9, wherein the additive comprises water.

35. The method of claim 33, wherein the additive varies the polyol component of the pre-foam stream.

36. An article of manufacture comprising:
a seamless foam product having a plurality of discrete ^{alternating} stripes, each stripe having at least one property different from adjacent stripes.

37. The article of claim 36, wherein said at least one different property comprises at least one of a different density, a different hardness, a different width, a different air permeability, a different tensile strength, and a different load bearing capacity.

38. The article of claim 36, wherein said at least one different property comprises a different color.

39. The article of claim 36, wherein the article is a cushioning product, a clothing product, or a bedding product.

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40. A method for making a foam product comprising:

a step for producing a pre-foam stream;

a step for achieving discrete segments across the entire pre-foam stream; and

a step for forming a cured, discretely striped foam.

41. The method of claim 40, wherein said stripes comprise colored stripes.

42. The method of claim 40, wherein the cured discretely striped foam is a bun.

43. The method of claim 40, wherein the cured discretely striped foam is a rectangular mass.

44. A method of making a striped foam, comprising, in order, the steps of:

preparing a pre-foam stream;

intermittently injecting into the pre-foam stream an additive to form a pre-foam stream having alternating segments with a variation in chemical composition between the alternating segments; and

pouring the pre-foam stream onto a surface, the pre-foam stream curing into a multi-segmented foam having a controlled variation in properties between each segment.

45. A device comprising:

a mixing chamber comprising at least one inlet introducing components of a pre-foam stream and mixing and passing said pre-foam stream at a first pressure through the chamber; and

at least one injector alternately introducing at least one additive into pre-foam stream at a pressure higher than said first pressure to provide distinct segments within the pre-foam stream; and

an outlet discharging a laminar flow of an alternately segmented pre-foam stream with chemical compositions varying between each segment.

46. The device of claim 45, wherein a single stream of pre-foam is provided at the mixing head.

47. The device of claim 45, wherein said single stream of pre-foam stream includes an isocyanate.

48. The device of claim 45, wherein the at least one injector introduces the additive at a pressure of about 10 to about 1000 psi.

49. The device of claim 45, wherein the at least one injector introduces the additive at a pressure of about 200 psi.

50. The device of claim 45, wherein the at least one injector ports into a laminar flow region of the mixing head.

51. The device of claim 45, wherein said at least one injector is located adjacent to an outlet of the mixing chamber.

52. The device of claim 45, further comprising a programmable control unit coupled to a three way valve which is coupled to the at least one injector, the control unit providing a predetermined pattern of alternating injection and non-injection.

53. The device of claim 52, wherein the pattern of the controller varies the duration of injection and the duration of non-injection.

54. The device of claim 52, wherein the injector has a minimum cycle time of opening and closing of about 0.1 seconds.

55. The device of claim 52, wherein the injector has a cycle time of opening and closing of about 0.1 sec to about 10 seconds.

56. A mixing machine comprising the device of claim 45 as a mixing head, and further comprising a trough, located beneath the outlet of the mixing head and receiving the alternately segmented pre-foam stream.

57. The device of claim 45, wherein the injector has a variable sized orifice for injecting additive.

58. A mixing machine comprising the device of claim 45 as a mixing head, and further comprising a conveyor, located beneath the outlet of the mixing head and receiving the alternately segmented pre-foam stream.

59. The mixing machine of claim 58, wherein the mixing head is stationary with respect to the conveyor.

60. A mixing machine comprising the device of claim 45, and further comprising at least one pre-foam stream materials tank; at least one isocyanate tank; at least one pressurized pre-foam stream feed line and at least one pressurized isocyanate line at a first pressure, at least one pressurized additive feed line in communication with the device at a second higher pressure, and a conveyor for conveying and curing the pre-foam stream mass.

61. An apparatus comprising:

means for providing a pre-foam stream at a first pressure;

means for intermittently injecting an additive into the pre-foam stream at a pressure higher than said first pressure, providing a laminar flow pre-foam stream with alternating segments having different chemical compositions; and

means for pouring the pre-foam stream onto a surface, to provide a discretely striped, multi-property foam bun.

62. The apparatus of claim 61, wherein the means for intermittently injecting includes at least one injector.

63. The apparatus of claim 62, wherein the at least one injector injects the additive into a laminar region of the pre-foam stream while substantially maintaining the laminar flow in the laminar flow region.

64. The apparatus of claim 61, further comprising a means for controlling the intermittently injecting means.

65. The apparatus of claim 64, wherein the means for controlling the means for intermittently injecting varies the time interval between intermittently injecting and not injecting the additive.

66. The apparatus of claim 65, wherein the time interval for injecting is at least about 0.1 second.

67. The apparatus of claim 65, wherein the time interval is up to about 10 seconds.

68. The apparatus of claim 61, wherein the means for controlling the intermittently injecting means pulses an injector orifice open and shut.

69. The apparatus of claim 61, wherein said forming means comprises a means for moving said alternatively segmented pre-foam stream into a trough.

70. The apparatus of claim 61, wherein said forming means comprises a means for pouring said alternatingly segmented pre-foam stream into a form.

71. The apparatus of claim 70, wherein said pouring means comprises a tubular form.

72. The apparatus of claim 70, wherein said pouring means comprises a rectangular form.

73. A system for producing a striped foam product, comprising:
a mixing head for providing a pre-foam stream; and
at least one pressurized injector porting into the mixing head controlled to intermittently inject an additive into said pre-foam stream to produce a discretely segmented pre-foam stream.

74. The system of claim 73, further comprising a conveyor, located at an outlet of the mixing head and receiving the discretely segmented, multi-property pre-foam stream, wherein the mixing head is static with respect to the conveyor.

75. The system of claim 73 further comprising:

at least one non-reactant materials tank in communication with the mixing head and providing a pre-foam stream through at least one pressurized pre-foam stream feed line;

at least one isocyanate tank in communication with the mixing head and providing an isocyanate stream through at least one pressurized isocyanate line;

at least one pressurized additive feed line in communication with the mixing head and providing additive;

at least one programmable control unit controlling the timing of the injecting; and

a conveyor for conveying and curing the pre-foam stream mass.

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